

DOCUMENT RESUME

ED 446 962

SE 064 184

AUTHOR Ciganek, Jindoich; Osner, Zdenik
TITLE How To Modernize Teaching at the Technical Universities?
PUB DATE 1998-08-00
NOTE 6p.; Paper presented at the Annual Meeting of the International Conference on Engineering Education (Rio de Janeiro, Brazil, August 17-20, 1998).
PUB TYPE Reports - Research (143) -- Speeches/Meeting Papers (150)
EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS *Audiovisual Instruction; *Educational Technology; Foreign Countries; Higher Education; Teaching Methods; *Visual Perception
IDENTIFIERS Czech Republic

ABSTRACT

Students coming at present to technical universities are accustomed to television and the visual perception is their prime source of information. This is why our civilization is being often labeled as the "civilization of picture". The contemporary psycho-physiological researches, along with the Dale's cone of human perception, also confirm an incomparably higher level of effectiveness with the visual perception. The actual way of university teaching, however, hardly reflects these facts. This is why it often becomes boring, unattractive and ineffective, as far as the students are concerned. On the other hand, one should not overestimate the enhanced of the visual perception in the teaching process, because it also carries bottlenecks and limitation. Its overdosing could even bring negative effects. The author, after having been for 15 years a manager at the audio-visual university center, will present his life-long experience in application of the audio-visual forms of teaching at the technical universities, with all the prospects and limitations, pluses and minuses thereof. He will also deal with the economical side of the problem and with the programmed teaching. He outlines the principles of a rational and effective use of the didactic techniques in the university teaching process. (Author)

How to modernize teaching at the technical universities?

Professor Jindřich CIGÁNEK, CSc. – Dean ,

Faculty of Civil Engineering,

VŠB–Technical University of Ostrava,

708 33 OSTRAVA, Czech Republic

e-mail: Jindrich.Ciganek@vsb.cz

Ing. Zdeník OSNER, CSc. – Generally Director,

ENERGIE Kladno, ENERGIE Kladno, a.s.

Vaš ekova 3081, 272 04 KLADNO 4, Czech Republic

Abstract- Students coming at present to technical universities are accustomed to television and the visual perception is their prime source of information. This is why our civilization is being often labeled as the "civilization of picture". The contemporary psycho-physiological researches, along with the Dale's cone of human perception, also confirm an incomparably higher level of effectiveness with the visual perception.

The actual way of university teaching, however, hardly reflects these facts. This is why it often becomes boring, unattractive and ineffective, as far as the students are concerned.

On the other hand, one should not overestimate the enhanced of the visual perception in the teaching process, because it also carries bottlenecks and limitation. Its overdosing could even bring negative effects. The author, after having been for 15 years a manager at the audio-visual university centre, will present his life-long experience in application of the audio-visual forms of teaching at the technical universities, with all the prospects and limitations, pluses and minuses thereof. He will also deal with the economical side of the problem and with the programmed teaching. He outlines the principles of a rational and effective use of the didactic techniques in the university teaching process.

Since time immemorial, the university teachers have endeavored to adjust their teaching to the level of their students perception and comprehension in order to achieve the best effect. The wisest teachers always tried first of all to stimulate the interest for the lectured branch of knowledge and if possible to demonstrate the lectured subject in nature (the well-known painting of Rembrandt "Doctor Tulp's anatomy lecture" of 1632, where Dr. Tulp documents the lecture on the hand physiology by dissecting the hand of an

executed criminal). The statement by John Amos Comenius, who was called also The Teacher of Nations, in his Great Didactic published in 17th century, postulated: "Let the golden rule of teachers be to present everything to the senses inasmuch as possible. The truth and certainty of teaching depends solely and exclusively on the testimony of senses."

This perception of teaching is being confirmed by the contemporary research. Evidence for this way of assertion may be found in the work published by HAPALA (lit. 1), who suggests that the distribution of information accepted by man from his normal living environments follows the example presented on Fig. 1.

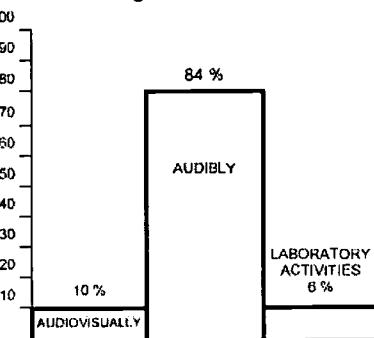


Fig 1 Perception of new knowledge in the Educational Process

However, the acceptance of new knowledge in the present traditional educational process diametrically different and, therefore, also unnatural and insufficiently efficient as apparent from Fig. 2.

PERMISSION TO REPRODUCE AND
DISSEMINATE THIS MATERIAL HAS
BEEN GRANTED BY

C. Jindřich

TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)

1

U.S. DEPARTMENT OF EDUCATION
Office of Educational Research and Improvement
EDUCATIONAL RESOURCES INFORMATION
CENTER (ERIC)

This document has been reproduced as received from the person or organization originating it.

Minor changes have been made to improve reproduction quality.

Points of view or opinions stated in this document do not necessarily represent official OERI position or policy.

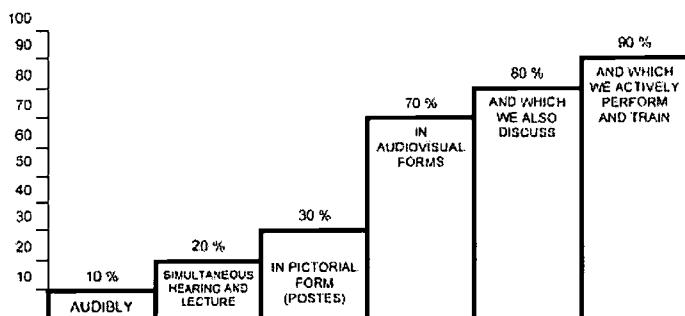


Fig 2 Percentage of remember information acquired

The state-of-art teaching technology offers a wide scope of teaching appliances ranging from slide projectors and reverse projectors to the computer-supported projection by means of the LCD panels and interactive systems of programmed teaching.

At a first glance, using these appliances brings about a considerable effect in teaching. Nevertheless, they have their limitations. Their unsuitable use can even harm the perception of students. We are quite often confronted with a sort of "crutches" whereby an inexperienced and self-conscious tutor wants to outweigh his professional deficiency by a massive use of the most modern technology. Naturally, there cannot be any positive effect achieved thereby.

Centuries-old experience instructs us that the best way of presenting new knowledge is the one where students are involved in the instruction process actively by their practical exercise and field training. After comparison of both diagrams the accentuation of the visual form of presentation of the new knowledge at all occasions where it is possible appears proper. This conclusion confirms also – among other things – the research on human memory the results of which suggest that man remembers on average after a three days period only a percentual quantity of initially presented information as illustrated on Fig. 3.

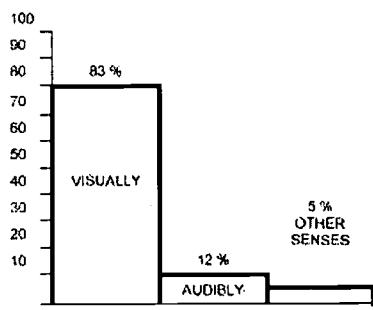


Fig 3 Acceptance of knowledge in everyday life

Therefore, the audio-visual methods of presentation of new knowledge in combination with practical activity are the most efficient ones.

Similar conclusions published also SCHNIDT [2] on the base of statistical research carried in 1980 at The University of Berlin.

The visualisation of methods of education and instruction is nowadays possible by numerous means of instruction, which can be divided into several generations according to their didactical effectiveness and capability:

- Traditional audio-visual didactical apparatus such as slide projectors, back projection apparatus, episcope, diaphone, film and video-recording. These aids can simulate the teacher only in a single function, but their capability in this single function by far exceeds the possibilities of live presentation.
- Mechanical examinators and repetitors using linear programs which can make use of the above didactical aids and multiply their efficiency by means of feedback of information on the quality and effectiveness in fulfilment of the task. The potency of these means is interior to that of the teacher, however, concerning the presentation of the feedback of information they are superior to the teacher because they allow to use a personal control circuit for each addresses.
- Mechanical examinators and repetitors for selected programs are capable of not solely of the elementary evaluation of the performance in linear dimensions "good" or "wrong" but in comparison to the preceding type they also allow that the addresses may select the strategy in instruction in similar linear dimension "forward" or "backward".
- Electronic teaching machines for branched programs are capable – in comparison to preceding types – of explaining individually the causes of unsatisfactory performance and decide on future instructional strategy accommodated to the individuality of the addresses.
- Control panels of automated classroom which – in addition to the preceding – allow the remote control of all applied audio-visual didactic means and liberate the teacher from purely mechanical activities. As result of

BEST COPY AVAILABLE

this, the teacher can fully concentrate on the operative control of the instructional process.

Computers can perform all didactic functions of the preceding generations of apparatus and – contrary to the earlier generations – they are capable of an independent creation of instructional strategies according to the required target parameters of instruction and particular performance of the individual in addition to the selection of the optimum programmed instructional strategy.

However, computers can simulate not only the teacher but also the student. Therefore, they allow in optimum conditions also the tests of effectiveness of individual instructional processes.

Modernization of instructional methods

In addition to numerous instructional methods which have been made possible by the didactic potency of individual generation classes of the used didactic technology and their mutual combinations, the appearance of problem and program methods of instruction, academic and simulation games including their derivates, PSI (Personalised System of Instruction) and other have been observed recently.

Apparently, CRUICKSHANK and MAGER [3] from the Ohio State University carried out the best categorisation up to the present of the broad scale of instructional methods, which is presented on Fig. 4. This categorisation classifies the instructional methods and distinguishes between the concrete, vicarious and abstract methods and also considers the application of concrete and model reality. It is appropriate to point out that taut this categorisation is based upon the premise of Teacher Education which, however, needsnot be fulfilled on all occasions, particularly when academic education is involved.

Use of reality		
	REAL Reality is used	MODELED a model of reality
CONCRETE	The teacher education. Student learns the ability concretely <i>in situ</i>	The teacher education. Student learns the ability while he/she engages with a model of reality <ul style="list-style-type: none"> ◆ microteaching ◆ reflective teaching ◆ simulations ◆ simulations games ◆ teacher performance testing
VICARIOUS	The teacher education. Student learns the ability vicariously from reality or a recording of reality <ul style="list-style-type: none"> ◆ observing teaching ◆ protocols ◆ documentary films ◆ case studies ◆ still pictures ◆ book, non-fiction ◆ tape recording 	
ABSTRACT	The teacher education. Student learns the ability abstractly with little or no access to or use of reality or a model of it. Emphasis is mainly or verbally communicating. The concept, skill or attitude. • Words.	

Fig 4 Professional Education: Instructional alternatives whereby teaching abilities

Perhaps the most meaningful typology of this kind was elaborated more than one decade ago by Professor EDGAR DALE [4] who specified it as "A visual analogy to show the progression of learning experiences from direct, first-hand participation to pictorial representation and on to purely abstract symbolic expression".

Didactic, methodological and dramaturgical criteria

One of the most important criteria for the evaluation of film is the criterion of their didactic and methodological value, which they present. The presentation of the film will exert

the required didactic effect on the average spectator only if its methodological and dramaturgical structure will be adequate to main syntactic and semantic film principles of the structure of didactic films. Even though that this case involves a relatively broad scale of principles which should be fulfilled from didactic, methodologic, and dramaturgical reasons, we shall present in the following at least the most important of them. The films predetermined for the instruction toward working safety at work shall:

- present the mater which cannot be adequately presented verbally or by means of statistic pictures, such as slides, episcopis projection, or back projection,
- be monothematic, because polythematic films are incomprehensible and can be understood and remembered only with difficulty,
- be cinematic and avoid static pictures and schemes,
- use comprehensive and visually legible schemes particularly diagrams,
- have captions and inscriptions of sufficient size; in this context it is generally valid that such films should avoid long text passages extending to more than one line; in case of necessity it is beneficial to use a simultaneous slide projection of the text on an adjoining screen; if text shots or slides are nevertheless applied, followings principles are valid:
 - not more than five words in the title,
 - not more than seven lines of the text,
 - not more than seven words in a line.

Similarly, the use of tables is not recommended and it is better to replace them by graphs. If shots of tables are nevertheless applied or slides projected on an adjoining screen, they shall have:

- not more than four columns,
- not more than five to six lines,
- use animated or trick sequences to enhance the comprehensibility,
- use sober and well considered commentary which shall be neither too quick nor to long; it should cover one half to two thirds of the available time interval,
- be without accompaniment of music, particularly in theoretically more demanding films. Music does not disturb during the initial and final stages of the film – eventually – in the middle part of the film during relaxation sequences. This, however, does not apply to sound effects and real sounds which increase the authenticity ant the informative value of the film and should be applied also in the instructional film,
- have the shortest possible time of projection, fifteen minutes is the maximum; if serious reasons call for longer projection time, the film shall include relaxation sequences to draw the attention of spectators,
- contain shots of maximum informative value and avoid shots which do not contain any information even though they may be effective,

- have adequate professional treatment concerning the dramaturgy, direction, camera, cut, etc. which can either be the crown of the devaluation of otherwise valuable film.

Conclusion

Since the time of Rembrandt, the scope of available didactic appliances has widened considerably. Those available for teachers in the next century will range from the chalk up to the computer-supported interactive methods. However, even in the coming millennium, not every teacher nor every school will be able to afford money-wise and time-wise the expensive tutorial systems like e.g. that available at the University of Illinois in Urbana.

Let us therefore express the feeling that the prevailing part of tutors will have to stick to chalk and projectors (slide, reverse and video) even in the next century, with even the projectors to be used in a judicious way. Professor Baran's human perception physiology research proved that the number of slides used during one hour of lecture should not exceed 8, as the students stop to perceive any slide on top of this number. Video recordings have also their limitations – they should just complement the lecture in short sequences, not replace it. However, any university that can afford having the more expensive interactive computer-supported systems should have them, remembering that they entail – apart from the expensive technology – a yet more expensive personnel. This means additional outlays, which at the end of the day do swallow and destroy even the most prospective projects. We are not aware of any country spoiling its schools by excessive budget for the sake of expensive didactic systems.

There is, however, no need to feel sad, Ladies and Gentlemen, since it is the teacher and not the didactic aids that will predestine the level of universities in the next millennium, as well as the education level, both in the professional and in the humane respect. (J.A. Comenius requested in the 17th century already that schools become "workshops of humanness".)

We should like to document this statement by an example, with your permission. A time ago, Charles University in Prague held a seminar aimed at convincing the university teachers about the importance of didactic aids in lecturing. At the beginning, one of the professors presented the multimedia teaching using simultaneously all available means of the present-day technology. This resulted in a nice but fatiguing show of which you could remember hardly anything afterwards. Another teacher was to present the unsuitability and outdatedness of the chalk-and-blackboard supported lecture. Seminar organisers made a mistake by having chosen a retired teacher who was not only an outstanding professional, but also an experienced educationalist. He managed to introduce into the auditory which fell silent a unique atmosphere of his personality, of the contact with his listeners and of their interest in the

lectured matter. Hence the seminar has completely misfired and proved again that it is indeed the teacher's personality that predestines the level and the efficiency of education.

Thank you for your attention.

Literature

- [1] HAPALA, D.: Didaktické materiálne prostriedky pri práci lektora. (The didactic material means for the work of a lecturer). Osvetová práca, 1979, No. 5
- [2] SCHMITT, G.: Potenzen der Entwicklung berufsrelevanter Fähigkeiten und Fertigkeiten in Vorträgen, Seminaren und Übungen im Meinungsbild junger Hochschullehrkräfte. Sb. IV. mezinár. konference ÚIS v Praze, Praha 1980
- [3] CRUICKSHANK, D., MAGER, G.: Toward Theory Building in the Field of Instructional Games and Simulation. Programmed Learning Educational Technology, Vol. 13, No 3, July 1976
- [4] DALE, E.: Audiovisual Methods in Teaching. Third Edition. Dryden Press, New York, 1969

SECRET

U.S. Department of Education
Office of Educational Research and Improvement (OERI)
[Image] [Image]

National Library of Education (NLE)
Educational Resources Information Center (ERIC)

Reproduction Release
(Specific Document)

I. DOCUMENT IDENTIFICATION:

Title: How To Modernise Teaching of the Technical Universities

Author(s): CIGÁNEK J., OSNER, Z.

Corporate Source:

Publication Date: 17.-20.8.1998

II. REPRODUCTION RELEASE:

In order to disseminate as widely as possible timely and significant materials of interest to the educational community, documents announced in the monthly abstract journal of the ERIC system, Resources in Education (RIE), are usually made available to users in microfiche, reproduced paper copy, and electronic media, and sold through the ERIC Document Reproduction Service (EDRS). Credit is given to the source of each document, and, if reproduction release is granted, one of the following notices is affixed to the document.

If permission is granted to reproduce and disseminate the identified document, please CHECK ONE of the following three options and sign in the indicated space following.

The sample sticker shown below will be affixed to all Level 1 documents all Level 2A documents all Level 2B documents
[Image] [Image] [Image]

Level 1
[Image]

Level 2A
[Image]

Level 2B
[Image]

Check here for Level 1 release, permitting reproduction and dissemination in microfiche or other ERIC archival media (e.g. electronic) and paper copy.
Check here for Level 2A release, permitting reproduction and dissemination in microfiche and in electronic media for ERIC archival collection subscribers only.
Check here for Level 2B release, permitting reproduction and dissemination in microfiche only.

Documents will be processed as indicated provided reproduction quality permits.

If permission to reproduce is granted, but no box is checked, documents will be processed at Level 1.

I hereby grant to the Educational Resources Information Center (ERIC) nonexclusive permission to reproduce and disseminate this document as indicated above. Reproduction from the ERIC microfiche, or electronic media by persons other than ERIC employees and its system contractors requires permission from the copyright holder. Exception is made for non-profit reproduction by libraries and other service agencies to satisfy information needs of educators in response to discrete inquiries.

Signature:

Printed Name/Position/Title:

CIGÁNEK Jindřich, prof. Ing., CSc.



Organization/Address:
VŠB - Technical University
of Ostrava,
17. listopadu 15
708 33 Ostrava / Czech Republic

Telephone: +420 69 699 1316 Fax: +420 69 699 1356
E-mail Address: Jindrich.Ciganek@vsb.cz Date: 28th November 2000

III. DOCUMENT AVAILABILITY INFORMATION (FROM NON-ERIC SOURCE):

If permission to reproduce is not granted to ERIC, or, if you wish ERIC to cite the availability of the document from another source, please provide the following information regarding the availability of the document. (ERIC will not announce a document unless it is publicly available, and a dependable source can be specified. Contributors should also be aware that ERIC selection criteria are significantly more stringent for documents that cannot be made available through EDRS.)

Publisher/Distributor:

Address:

Price:

IV. REFERRAL OF ERIC TO COPYRIGHT/REPRODUCTION RIGHTS HOLDER:

If the right to grant this reproduction release is held by someone other than the addressee, please provide the appropriate name and address:

Name:

Address:

V. WHERE TO SEND THIS FORM:

Send this form to the following ERIC Clearinghouse:

ERIC/CSMEE
1929 Kenny Road
Columbus, OH 43210-1080